VALUE OF SWAMP LANDS

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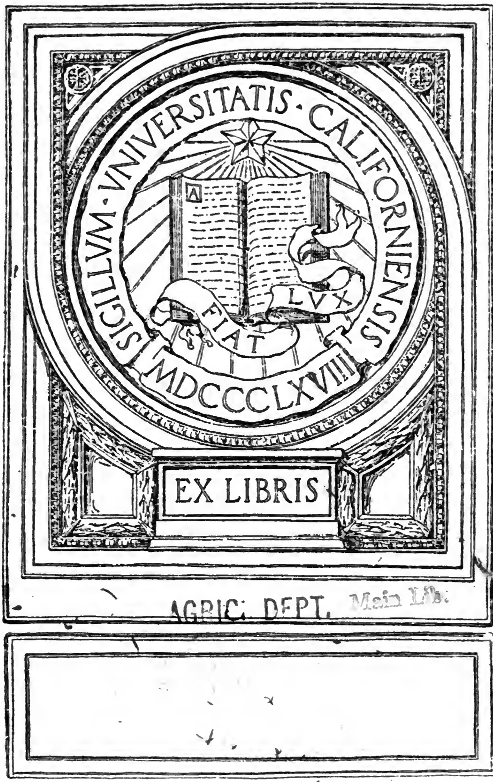
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VALUE OF SWAMP LANDS

Value of Swamp Lands,

or

How to Make

Unproductive Black Soils More Valuable.

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VALUE OF SWAMP LANDS.

Most farmers in hilly or rolling sections are familiar with swamp, or black, soils. In some sections nearly every farm has a low, wet place where the soil is black and sticky. In the middle West, notably in Indiana and Illinois and adjoining states, there are large areas of these swamps or black lands which are called "unproductive" and frequently are not cultivated. In fact, so much of this land is found in the two states just mentioned that the experiment stations have made a special study of this class of soils. Farmers have generally been taught to believe that the black soils are naturally very rich in plant food.

"The swamps ought to be rich since they have received for centuries the drainage from the hills".

We often hear farmers make that statement and there is much truth in it. Many of these places represent the bottoms of old ponds, the water having dried out or escaped in some way so as to leave the bottom bare. Here Nature has locked up great treasures of plant food, and in doing so, as we shall see, carried the key away with her.

In a general way two methods of handling such soils have been tried, both based on the theory that swamp soil or muck contains a well balanced ration of all needed

plant food. The mistake in the theory has made both methods disappointing. One plan is to dig out the muck, leave it for a time to "sweeten", and then spread it on the upper fields of the farm like manure. But in all cases where muck is used alone for fertilizing other fields, the final result is disappointing. Somehow the muck does not "hold out" or continue to give good crops.

Another well known method is to drain the swamp either with open ditches or tile, and thus reduce the level at which water stands. When this is done the soil can be worked with horse tools and planted with ordinary crops. Thus in one case the swamp is carried to crops in higher fields, while in the other the swamp is dried and the crops are brought to it. It is noticed that when grass is seeded in these drained swamps it usually makes a good growth for a few vears. Small grain also does fairly well, though inclined to lodge or fall down. In many swamps, corn, while making a fair stalk, refuses to ear well; and potatoes make heavy vines but produce poor tubers. Farmers have often observed these facts about black soil or muck and have wondered why this apparently rich soil fails. In theory it ought to be nearly as rich as manure, yet it is true that swamp lands seldom give permanent satisfaction without the addition of some form of fertilizer.

What is the matter with the soils?

The answer, by chemical analysis and practical experience alike, is that they lack available potash. In Indiana analyses were made of many such soils and in

every case a deficiency of potash was shown. In most cases there was less than one-tenth of the potash found in average soils throughout the state. The following analysis, taken from Bulletin Number 95 of the Indiana Station, shows, in part, the composition of such a soil:

	TOP SOIL.	SUB-SOIL.
Nitrogen.......	3.22 per cent.	2.84 per cent.
Phosphoric Acid	0.46 "	0.27 "
Potash.........	0.105 "	0.108 "

In some cases a chemical analysis of a soil is of little value to the farmer, but this one gives a clue to the solution of a puzzling farm problem. Here we have a soil containing as much nitrogen as a large proportion of the chemical fertilizers offered for sale, three or four times as much phosphoric acid as a good average soil, but only about one-tenth as much potash as will be found in average clay loam. It is easily seen from this why such soil fails to produce good crops year after year. There is nitrogen and phosphoric acid enough to last 500 years, but the lack of potash renders these elements useless for the production of crops like potatoes or grain. Even the potash found naturally in such soil is, for the most part, unavailable, being in such forms that the plants cannot use it.

It will, of course, be asked how such soil can be rich in nitrogen and phosphoric acid and yet low in potash. In Bulletin No. 93 of the Illinois Station the following explanation is made for the lack of potash in peaty soils:

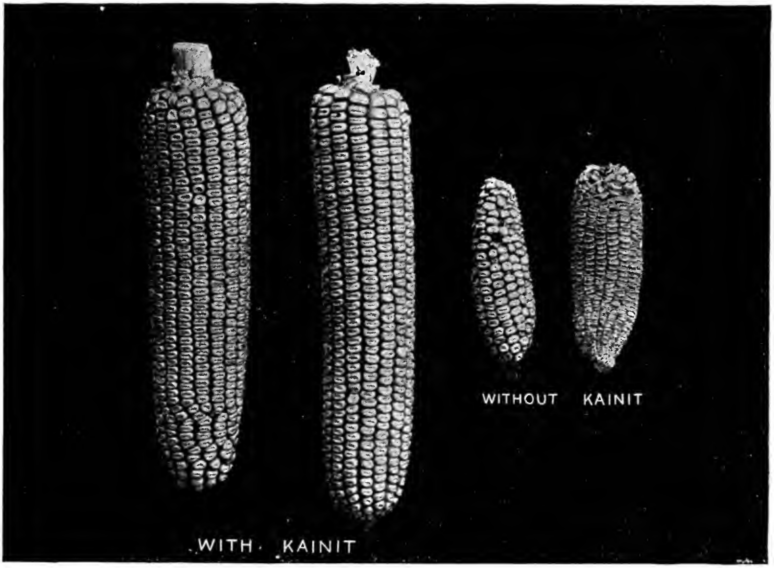
"Peat itself consists largely of partially decayed sphag

num moss, which grew in the water once covering these areas. In growing, the moss obtains carbon from the carbon dioxide in the air, and hydrogen and oxygen from water, being similar to other plants in this respect. The water in which the sphagnum moss grows is more or less stagnant. It is usually surface drainage or seepage water, and contains sufficient nitrogen, phosphorus, potassium, and other essential elements of plant food to meet the needs of the growing moss. Both nitrogen and phosphorus enter into fairly stable organic combinations with the carbon, hydrogen, and oxygen, and when the moss changes to peat, and even when the peat partially decays, these two elements, nitrogen and phosphorus (especially the nitrogen), are largely retained in the organic matter. The potassium, however, reverts more largely to the soluble form and it is finally lost to a greater or less extent in the drainage waters flowing from the peat bogs.

"A considerable number of peaty swamp soils from different places in the State have been analyzed by the Experiment Station, and they are found to be very rich in nitrogen, well supplied with phosphorus, but very deficient in potassium, as compared with the ordinary fertile soils of the state."

Farmers are not always ready to accept such scientific theories without proof which they can understand,—that is the actual results with crops. Ample proof of this kind has been given by both the Illinois and Indiana Experiment Stations. In Indiana it was found that many of these tracts of swamp land were very hard to drain. Of course they

could not be permanently improved until the surface water was removed Where water stands thirty inches below the surface such a crop as corn cannot be successfully grown. Since it was impossible for the owners of such lands to drain them thoroughly by ordinary means, experiments were made to see what temporary improvement could be made



AVERAGE SAMPLES OF CORN GROWN ON SWAMP LAND, WITH AND WITHOUT KAINIT.
Experiment made by Experiment Station of Indiana.

in the crops. Part of the land selected for the experiments was plowed in the ordinary way. Another part was sub-soiled in addition,—that is, after plowing, a sub-soil plow was run deeper in each furrow,—not turning the lower soil

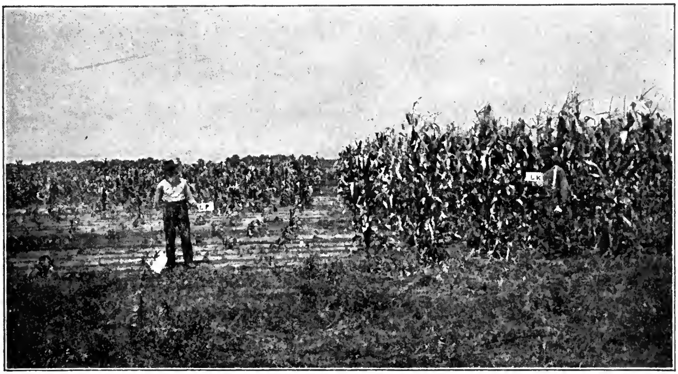
over but simply breaking it up. Plots of equal size in each portion were laid out, one being planted as it stood to test the natural capacity of the soil. On another plot kainit at the rate of one ton per acre was used, on another the same amount of kainit and lime at the rate of five tons per acre, and another an equal amount of lime alone. The kainit contained no plant food but potash. The object in using the lime both alone and with the kainit was to test the oft-repeated claim that lime will set such soils right.

The following table shows the results:

PLOWING	ADDITION	YIELDS PER ACRE		
		SOUND CORN BUSHELS	POOR CORN BUSHELS	FODDER TONS
Ordinary	None	28.6	11.0	1.39
"	Kainit	55.8	4.4	2.43
"	Kainit & Lime	52.4	6.8	2.48
"	Lime	25.1	11.6	1.48
Sub-soil	None	16.1	12.0	1.04
"	Kainit	60.4	2.3	2.43
"	Kainit & Lime	52.0	2.2	2 21
"	Lime	15.04	10 5	1 04
"	None	4.0	12 6	0.96

No one could ask for stronger evidence than this. It is exactly what we had a right to expect from the analysis of

the soil. Not only was the potash in the soil deficient as compared with other soils but what there was present was unavailable to plants. When the kainit was used as a fertilizer the corn received what it needed, and gave a fair crop even on this poorly drained soil. Take the average of the two plots and the natural soil gave only 17.35 bushels of sound corn and 11.50 bushels of poor corn. The average



CORN GROWN ON SWAMP SOIL.

NO POTASH ON LEFT. WITH POTASH ON RIGHT.

Experiment Conducted by the Illinois Experiment Station.

of the plots where kainit was used shows 58.1 bushels of sound and 3.35 of poor corn. There can be no question that this increase was due to the potash in the kainit. The use of lime alone was not satisfactory. We see from the table that what the soil needed was potash. The lime could not furnish potash or set it free in the soil and thus it failed to produce the crop. Not only is this so but you

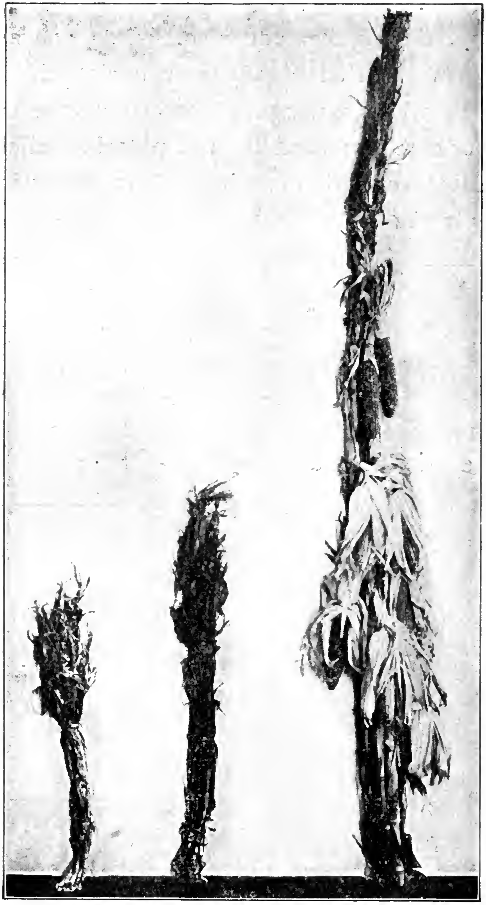
will notice that where the kainit was used the proportion of poor corn is lowest. It is always the rule that an abundant supply of potash ensures a plump ear, well filled to the tip. The benefit was not confined to the first year. For ten years after the kainit was used there was an increase in yield. In 11 years this gain over the natural soil amounted to 594 bushels per acre, which represents the gain from using one ton of kainit. At the average selling price of 35 cents per bushel this means $207.90. In every case where potash has been used on these black, unproductive soils the gain in the crop yields has been remarkable.

The results on similar soils in Illinois, as recorded in Bulletin No. 93 were just as marked. In every case where potash was used the yield of the corn was increased. Analysis of this Illinois soil showed much the same condition as was found in Indiana,—the black or swamp soil contained several times as much nitrogen as the best soils in the corn belt and also an abundance of phosphoric acid. It was, however, almost entirely deficient in available potash. It was this lack of potash, combined with poor drainage, that made these soils unproductive. The use of lime alone did not increase the yield greatly because it did not add potash. These Illinois experiments were even more elaborate than those in Indiana. One soil thus tested consisted of about 16 inches of black peat, then 14 inches of lighter soil, with a sub-soil of coarse sand. This soil was a failure at producing ordinary crops,—particularly corn. While analysis showed a lack of potash it was determined to try

the other fertilizing elements also. Nitrogen was furnished in the form of dried blood, phosphoric acid in steamed bone meal, while muriate of potash at the rate of 200 pounds per acre was used for the potash. Lime was also used on all the experiment plots. The result is shown in the following table:

	YIELDS PER ACRE	
	CORN BUSHELS	STOVER POUNDS
None	0	1,000
Lime	0	800
Lime, nitrogen	0	1,200
Lime, phosphorus	0	2,000
Lime, potassium	36.3	3,600
Lime, nitrogen, phosphorus	0	1,400
Lime, nitrogen, potassium	40.0	3,500
Lime, phosphorus, potassium	37.5	3,100
Lime, nitrogen, phosphorus, potassium	60.0	4,400
Nitrogen, phosphorus, potassium	52.5	4,750

The results are even more striking than on the Indiana soil. It was evident that lime was not the needed addition, for even where nitrogen and phosphoric acid were used



Without Potash. **With Potash.**

AVERAGE CORN STALKS, WITH AND WITHOUT POTASH, GROWN ON THE FARM OF MR. J. H. MILLIGAN AT TAMPICO, ILLINOIS.

WITHOUT POTASH, NO YIELD. WITH POTASH, YIELD FROM 36 TO 60 BUSHELS OF SHELLED CORN PER ACRE.

Experiment made under the direction of the Illinois Experiment Station.

alone or together, with lime, no ear corn was made. Just as we should expect, these elements of plant food increased the growth of stalk, but could not complete the ear. It was only when potash was added that the ear was formed.

The potash need of corn is made very clear in this bulletin. The stalks required to grow a crop of 100 bushels of corn contain 52 pounds of potash while the grain contains 19 pounds, or 71 in all. As the stalks grow before the ears are formed, they will exhaust the potash in the soil, if it is deficient, so that when the ears are made there is little potash left for them. The result will be small and imperfect ears and poor grain. One Illinois farmer gave a good illustration of this. His soil was a black peat 16 inches deep. The experiment station used it for growing corn, and among other chemicals used potash at the rate of 200 pounds muriate per acre. The result was that no ear corn was produced where no potash was used, while in every case where potash was added,-alone or with other chemicals, from 36 to 60 bushels of corn per acre were grown. The owner of this farm saw how potash produced corn and he was so impressed with the results that he decided to use potash again. The following year he used fifty pounds of muriate of potash per acre. The result was a good crop of stalks but no ear corn. We can easily see the reason for this. There was little or no available potash in the soil. The corn crop was obliged to depend upon what was added in the muriate of potash. The stalks alone required 52 pounds of potash to make a full growth. The fifty pounds

of muriate containing 25 pounds of pure potash added less than enough to grow the stalks and there was absolutely none left to provide for the ears. This shows the necessity of using at least 200 pounds of muriate per acre on such soils.

BUCKWHEAT GROWN ON SWAMP SOIL, ON THE FARM OF MR. C. C. PORTER, AT MOMENCE, ILLINOIS.

ON THE LEFT—NO POTASH. ON THE RIGHT—WITH POTASH.

Another example of the necessity of potash is shown in the photograph illustrating the results obtained on corn by Mr. George Wakeman, near Momence, Ill. He made a heavy application of stable manure to the field shown at the left side of the picture, and applied muriate of potash to another portion of the field, shown on the right side. The results are very striking. The stable manure produced

FARM OF GEO. WAKEMAN, NEAR MOMENCE, ILL.
CORN ON SWAMP LAND.
ON LEFT STABLE MANURE ONLY. ON RIGHT MURIATE OF POTASH ONLY.

little effect, because it contained only a very small amount of potash, while the large quantity of nitrogen and in addition thereto, the phosphoric acid, were not needed on this particular soil. Muriate of potash used alone made a heavy crop of corn.

An abundance of evidence has been obtained to prove that potash is the needed element in these black or peaty soils. We know of a low valley which has been drained and planted in celery. It has been found that kainit alone year after year will produce good crops of celery while any mixtures of chemicals containing no potash will fail. From what has already been said we can easily see why this is so, for while the soil of the valley provides ample nitrogen and

phosphoric acid, it has little if any available potash. In this same valley potatoes planted in the natural soil grow a large vine and a coarse, watery tuber, unfit to eat. Add sulphate of potash and the tubers grow white and "mealy", excellent in quality. That is just what we would expect, knowing the influence of potash on the formation of starch and on quality. The simple truth is that these black swamp lands are really the most valuable soils on the farm. They need drainage to take out the surplus water and potash to provide the missing fertility.

AVERAGE COMPOSITION OF POTASH SALTS

and Application Recommended in Pounds per acre for use on Black Unproductive Soils.

NAME OF SALTS.	PER CENT. OF PURE POTASH. AVERAGE.	POUNDS. PER ACRE.
A. Salts containing Chlorides:		
Muriate of Potash................	50	200
Manure Salt....................	20	500
Kainit (crude salt)................	12.4	800
B. Salts free of Chlorides:		
Sulphate of Potash...............	50	200
Sulphate of Potash-Magnesia.....	27	400